Volunteer Lake Assessment Program Individual Lake Reports

PAWTUCKAWAY LAKE, NOTTINGHAM, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	13,248	**Max. Depth (m):**	15.2	**Flushing Rate (yr^{1})**	2.3
Surface Area (Ac.):	900	**Mean Depth (m):**	2.9	**P Retention Coef:**	0.61
Shore Length (m):	27,700	**Volume (m^3):**	10,740,000	**Elevation (ft):**	250

TROPHIC CLASSIFICATION

Year	Trophic class
1989	MESOTROPHIC
1998	MESOTROPHIC

KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

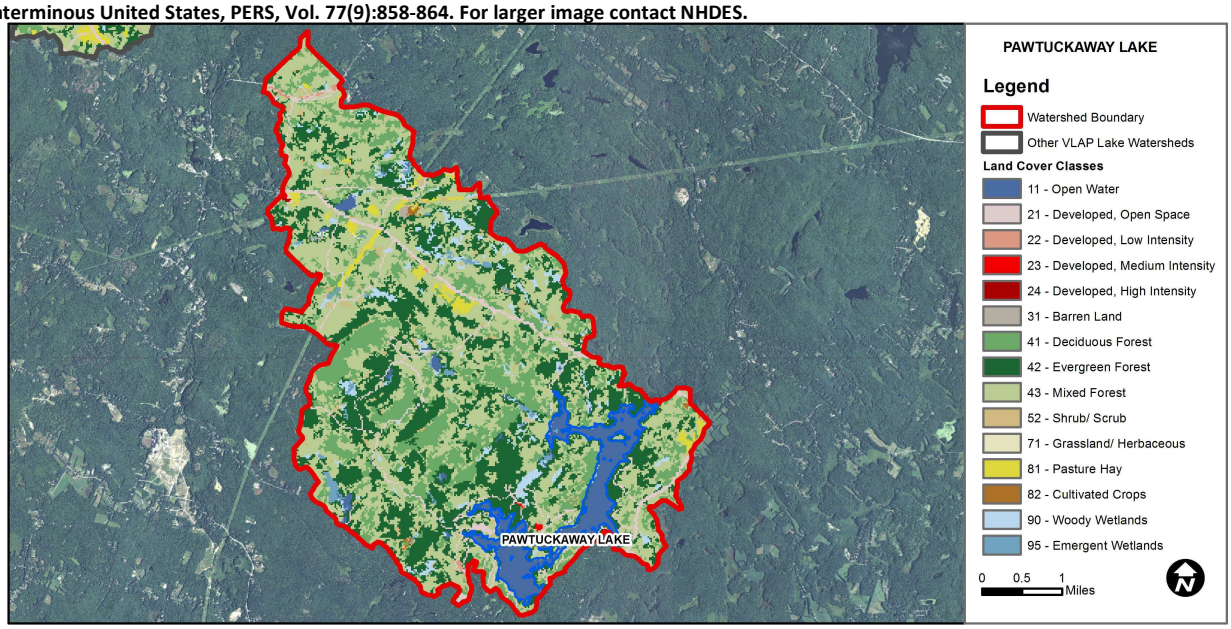
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Slightly Bad	The calculated median is from 5 or more samples and is > indicator and the chlorophyll a indicator is exceeded.
	pH	Bad	>10%, with a minimum of 2, samples exceed criteria, with 1 or more by a large margin.
	Oxygen, Dissolved	Very Good	There are a total of at least 10 samples with 0 exceedances of criteria.
	Dissolved oxygen satura	Slightly Bad	There are >10% of samples (minimum of 2), exceeding criteria.
	Chlorophyll-a	Slightly Bad	The calculated median is from 5 or more samples and is > indicator.
Primary Contact Recreation	Escherichia coli	No Data	No data for this parameter.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Good	There are at least 10 samples with one, but < 10% of samples, exceeding indicator.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

PAWTUCKAWAY LAKE - TOWN BEACH	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.
PAWTUCKAWAY LAKE - PAWTUCKAWAY STATE PARK BEACH	Escherichia coli	Bad	There are >=1 exceedance(s) of the geometric mean and/or >=2 single sample criterion exceedances. One or more exceedance is >2X criteria.
PAWTUCKAWAY LAKE - PAWTUCKAWAY STATE PARK BEACH	Cyanobacteria	Slightly Bad	Cyanobacteria bloom(s).

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	6.52	Barren Land	0.09	Grassland/Herbaceous	0.06
Developed-Open Space	4.12	Deciduous Forest	16.26	Pasture Hay	1.5
Developed-Low Intensity	0.19	Evergreen Forest	26.59	Cultivated Crops	0.16
Developed-Medium Intensity	0.05	Mixed Forest	38.87	Woody Wetlands	3.15
Developed-High Intensity	0.02	Shrub-Scrub	1.49	Emergent Wetlands	0.92

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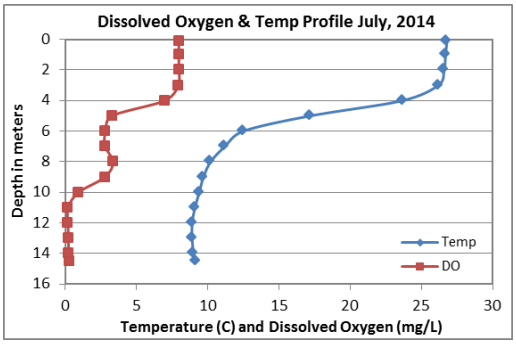
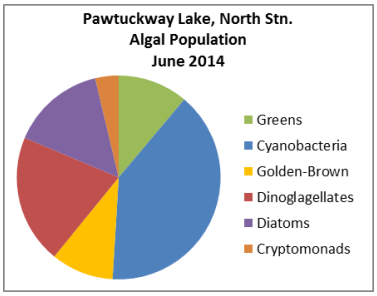
Pawtuckaway lake, North Stn., Nottingham
2014 Data Summary

Observations and Recommendations (*Refer to Table 1 and Historical Deep Spot Data Graphics)*

- **Chlorophyll-a:** Chlorophyll levels were slightly elevated in May but decreased to low levels in June and then increased to average levels from July to Sept. The 2014 average chlorophyll level was less than the state median and the lowest measured since 2003. Historical trend analysis indicates relatively stable chlorophyll levels with moderate variability between years.
- **Conductivity/Chloride:** Deep spot conductivity and chloride levels were approximately equal to the state median and historical trend analysis indicates relatively stable epilimnetic (upper water layer) conductivity with moderate variability between years. Back Creek B, Drowns Dam, Fundy Bk., and Round Pond Bk. conductivity and chloride levels were within a low to average range. White Grove Brook conductivity levels were slightly above average and chloride levels indicate road salt is likely the cause. Fernalds A and B experienced elevated conductivity and chloride levels due to agricultural activities.
- **Total Phosphorus:** Epilimnetic and metalimnetic (middle water layer) phosphorus levels were slightly elevated in May likely due to spring turnover and a significant storm event prior to sampling, however phosphorus levels decreased to low to average levels from June through Sept. Hypolimnetic (lower water layer) phosphorus levels increased as the summer progressed due to the release of phosphorus from bottom sediments as dissolved oxygen levels were depleted, a process called internal loading. Historical trend analysis indicates significantly increasing (worsening) epilimnetic and hypolimnetic phosphorus levels since monitoring began. Back Creek B, Fundy Bk. and Round Pond Bk. phosphorus levels remained fairly stable from May to Sept. and were within average ranges for those stations. Historical trend analysis indicates significantly decreasing phosphorus levels in Fundy and Round Pond Bks. Since monitoring began, we hope to see this continue! Fernalds A and B experienced elevated phosphorus due to agricultural activities. White Grove Bk. phosphorus was elevated in June and the turbidity was also elevated. Tributary flow was low and sediment/organic matter likely caused the elevated phosphorus, however historical trend analysis indicates significantly increasing phosphorus levels in White Grove Bk. since monitoring began, and particularly since 2002.
- **Transparency:** Transparency has been measured with the use of a viewscope since 2007; prior to that transparency was measured with and without the viewscope. Transparency was low in June with the elevated algal growth and then improved and remained fairly stable from June to September. The 2014 average transparency was better than the state median and the best measured since 2009. Historical trend analysis of viewscope data ('07-'14) indicates stable transparency.
- **Turbidity:** Epilimnetic and metalimnetic turbidities were within an average range for those stations. Hypolimnetic turbidity increased as the summer progressed and organic compounds accumulated in hypolimnetic waters. Back Creek B turbidity was slightly elevated in May following a storm event and flushing. Drowns Dam and Round Pond Bk. turbidities were slightly elevated in Sept. during a rain event. Fernalds A turbidity was elevated in June and July during low flows.
- **pH:** Epilimnetic pH levels were within the desirable range 6.5-8.0 units May - Aug. but then decreased in Sept. Historical trend analysis indicates highly variable epilimnetic pH since monitoring began. Metalimnetic, hypolimnetic, Back Creek B, and Fundy Bk. pH levels fluctuated below the desirable range.
- **Recommended Actions:** Deep Spot and White Grove Bk. phosphorus levels have significantly increased. Educate lake and watershed residents on ways to reduce phosphorus loading and stormwater runoff from their properties to offset the internal phosphorus load in the hypolimnion. Continue watershed management activities to reduce pollutant loads to the lake. Keep up the great work!





NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m^3
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

Table 1. 2014 Average Water Quality Data for Pawtuckaway Lake, North Stn.

Station Name	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Cond. uS/cm	Total P ug/l	Trans. m / VS	Turb. ntu	pH
Epilimnion	4.7	3.94	7	44.1	12	4.60	0.95	6.72
Metalimnion				45.9	11		1.20	6.26
Hypolimnion				53.1	59		6.08	6.20
#09 Fernalds B			36	232.3	955		1.98	7.19
Back Creek B				53.0	30		1.24	6.45
Drowns Dam			7	44.2	17		1.32	6.58
Fernalds A			43	348.4	4155		4.62	7.17
Fundy Brook			12	50.8	24		1.18	5.30
Round Pd. Brook			3	28.0	19		1.26	6.53
White Grove Brook			32	69.3	39		2.73	6.45

Historical Water Quality Trend Analysis

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data moderately variable.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
pH (epilimnion)	Stable	Trend not significant; data highly variable.	Transparency	Stable	Trend not significant; data show low variability.
			Phosphorus (epilimnion)	Worsening	Data significantly increasing.